

CURRICULUM VITAE

Alexander L. Gavriilyuk

PRESENT POSITION

Postdoctoral Fellowship granted by Japan Society for the Promotion of Science (JSPS), September 2013 – September 2014, at Tohoku University (Sendai, Japan). Host Professor: Akihiro Munemasa.

Researcher at the Department of Algebra and Topology, Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences.

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PERSONAL DATA

Date of Birth: Oct. 21, 1984.

EDUCATION

Ph.D. in Mathematics, Institute of Mathematics and Mechanics, Yekaterinburg, 2008.

Thesis: ” *Amply regular graphs, block desings and their automorphisms*”.

Advisor: Professor Alexander A. Makhnev.

Diploma (with honours) in Data Transmission Security, Radiotechnical Institute of Ural State Technical University, Yekaterinburg, 2006.

EMPLOYMENT

- Sep. 2013 – Sep. 2014: **Postdoc** at Tohoku University, Graduated School of Information Sciences (Sendai, Japan).
- Dec. 2011 – Aug. 2013: **Principal researcher** (image processing, pattern recognition) at ”3DiVi LLC”, R&D Department (Yekaterinburg, Russian Federation).
- Sept. 2010 – Aug. 2013: **Docent** at Ural Federal University (Yekaterinburg, Russian Federation).
- July 2008 – *present*: **Researcher** at Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences (Yekaterinburg, Russian Federation).
- Oct. 2007 – Jan. 2010: **Researcher** (image processing, pattern recognition) at ”Data-Center LLC”, R&D Department (Yekaterinburg, Russian Federation).
- Sept. 2007 – Sept. 2010: **Teaching Assistant** at Ural State Technical University (Yekaterinburg, Russian Federation).
- May 2003 – July 2008: **Junior Researcher** at Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences (Yekaterinburg, Russian Federation).

RESEARCH INTERESTS

I am interested in combinatorial structures (mainly, in graphs) with some properties of regularity, and their applications (such as coding theory):

- Algebraic graph theory: association schemes, distance-regular graphs, spectra of graphs (in particular, graphs with few eigenvalues),
- Coding theory: completely regular codes, subspace codes,
- Design theory: systems of linked symmetric designs, embedding of designs into Johnson schemes, extensions of symmetric designs,
- Finite geometry: Grassmann and bilinear forms graphs, nice subsets of finite projective spaces (Cameron-Liebler line classes, projective 2-weight codes, q -Steiner designs),

In my Ph.D. Thesis I studied embeddings of block designs into amply regular graphs. The triangle-free strongly regular graphs give an intriguing example of such embedding. There are only seven triangle-free strongly regular graphs known with $\mu < k$. Among them, the Clebsch graph and the Higman–Sims graph are from an infinite series of feasible parameters $(v, k, \lambda, \mu) = ((r^2 + 3r)^2, r^3 + 3r^2 + r, 0, r^2 + r)$ (for $r = 1$ and 2 , respectively). Among other results, for the parameters $(324, 57, 0, 12)$ (i.e., $r = 3$) nonexistence was shown in my Ph.D. Thesis. For $r > 3$ still nothing is known.

TEACHING

(Courses taught at Ural Federal University.)

Theory of Graphs and Their Applications. Spring 2009, Spring 2010, Spring 2011, Spring 2012.

Linear Algebra (basic course for engineers). Fall 2009, Fall 2010.

Mathematics (basic course for Finances & Economics Faculty). Fall 2009, Spring 2010, Fall 2010, Spring 2011.

Computer Vision. Fall 2010, Spring 2011, Fall 2012.

GRADUATE STUDENTS SUPERVISED

Sergey Goryainov, M.S. in Mathematical Sciences (2011), Chelyabinsk State University.

Thesis: "On perfect 2-colorings of Johnson graphs $J(n, 3)$ ".

Summary: We study equitable partitions of Johnson graphs $J(n, 3)$ into two classes. In particular, we found all such partitions if n is odd.

Konstantin Cherenkov, M.S. in Computer Sciences (2013), Ural Federal University.

Thesis: "Face recognition based on range images" (supervision joint with Alexander Shusharin, 3DiVi).

Summary: We studied some problems related to face recognition based on range images such as: head reconstruction (from range images), localization of facial (anthropometric) points.

PhD STUDENTS

Sergey V. Goryainov, Institute of Mathematics and Mechanics UB RAS (since 2011).

PAPERS

Submitted:

A.L. Gavriilyuk, J.H. Koolen: *The Terwilliger polynomial of a Q -polynomial distance-regular graph and its application to pseudo-partition graphs.*

Published / Accepted:

18. A.L. Gavriilyuk, K. Metsch: *A modular equality for Cameron – Liebler line classes.* Journal of Combinatorial Theory, Series A, *accepted*.

17. A.L. Gavriilyuk, I.Yu. Mogilnykh: *Cameron – Liebler line classes in $PG(n, 4)$.* Designs, Codes and Cryptography, *accepted*. DOI 10.1007/s10623-013-9838-z.

16. A.L. Gavriilyuk, I.Yu. Mogilnykh: *On the Godsil – Higman necessary condition for equitable partitions of association schemes.* Sib. Elektron. Mat. Izv., 10 (2013), 699-704.

15. A.L. Gavriilyuk, S.V. Goryainov, V.V. Kabanov: *On the vertex connectivity of Deza graphs.* Trudy Inst. Mat. i Mekh. UrO RAN, 19, no. 3, 2013, 94-103.

14. A.L. Gavriilyuk, A.A. Makhnev: *There exist no distance-regular graphs with intersection array $\{45, 30, 7; 1, 2, 27\}$.* Discrete Mathematics and Applications, 2013, 23:3-4, 225-244.

13. A.L. Gavriilyuk, A.A. Makhnev: *Distance-regular graphs with intersection arrays $\{52, 35, 16; 1, 4, 28\}$ and $\{69, 48, 24; 1, 4, 46\}$ do not exist.* Design, Codes and Cryptography, Vol. 65, no. 1-2 (2012), 49-54.

12. A.L. Gavriilyuk, S.V. Goryainov: *On perfect 2-colorings of Johnson graphs $J(n, 3)$.* Journal of Combinatorial Designs. 21 (2013), no. 6, 232-252.

11. A.L. Gavriilyuk, A.A. Makhnev: *On Terwilliger graphs in which the neighborhood of each vertex is isomorphic to the Hoffman-Singleton graph.* Mathematical Notes, Vol. 89, no. 5 (2011), 633-644.

10. A.L. Gavriilyuk: *Distance-regular graphs with intersection arrays $\{56, 36, 9; 1, 3, 48\}$ and $\{55, 36, 11; 1, 4, 45\}$ do not exist.* Doklady Mathematics, Vol. 84, no. 1 (2011), 444-446.

9. A.L. Gavriilyuk: *On the Koolen-Park inequality and Terwilliger graphs.* Electronic Journal of Combinatorics, 2010, R125.

8. A.L. Gavriilyuk: *The classification of Ryser graphs.* Mathematical Notes, Vol. 86, no. 1 (2009), 14-21.

7. A.L. Gavriilyuk, A.A. Makhnev: *Terwilliger graphs in which the neighborhood of some vertex is isomorphic to the Petersen graph.* Doklady Mathematics, Vol. 78, no. 1 (2008), 550-553.

6. A. L. Gavriilyuk, Wenbin Guo, A. A. Makhnev: *Automorphisms of Terwilliger graphs with $\mu = 2$.* Algebra and Logic, Vol. 47, no. 5 (2008), 330-339.

5. A.L. Gavriilyuk, A.A. Makhnev: *On automorphisms of distance regular graph with intersection array $\{60, 45, 8; 1, 12, 50\}$.* Trudy IMM UrO RAN, Vol. 13, no. 3 (2007), 41-53. (*In Russian.*)

4. A.L. Gavriilyuk, A.A. Makhnev: *Terwilliger Graphs with $\mu \leq 3$.* Mathematical Notes, Vol. 82, no. 1 (2007), 13-24.

3. A.L. Gavriilyuk, A.A. Makhnev: *On the regularity problem in Terwilliger graphs.* Doklady Mathematics, Vol. 76, no. 3 (2007), 820-823.

2. A.L. Gavriilyuk, A.A. Makhnev: *Amply regular graphs and block designs.* Siberian Math. J., Vol. 47, no. 4 (2006), 621-33.

1. A.L. Gavriilyuk, A.A. Makhnev: *On Krein graphs without triangles*. Doklady Mathematics, Vol. 72, no. 1 (2005), 591-594.

Other:

N.M. Porotnikova, M.V. Ananyev, E.Kh.Kurumchin, A.L.Gavriilyuk, A.A.Pankratov: *Effect of oxygen nonstoichiometry on kinetics of oxygen exchange and diffusion in lanthanum-strontium manganites*. Russian Journal of Electrochemistry, October 2013, V. 49, Issue 10, pp. 963-974.

D.A. Medvedev, M.V. Ananyev, A.L. Gavriilyuk, V.B. Malkov: *Electrical conductivity and microstructure image analysis of Co, Cu and Ni-doped barium cerates*. 18th International Conference of Solid State Ionics. Warsaw, Poland, 3-8 July, 2011. P. 297.

A.L. Gavriilyuk: *Investigation of parameters of coding in a point-locomotive communication channel*. Trudy Inst. Mat. i Mekh. UrO RAN, Vol. 17, no. 1 (2011), 38-52. (*In Russian.*)

A.L. Gavriilyuk, A.A. Makhnev, D.V. Paduchikh: *Distance-regular graphs in which neighborhoods of vertices are isomorphic to the Gewirtz graph*. Trudy Inst. Mat. i Mekh. UrO RAN, Vol. 16, no. 2 (2010), 35-47. (*In Russian.*)

A.L. Gavriilyuk: *On Terwilliger graphs with $\mu = 4$* . Trudy Inst. Mat. i Mekh. UrO RAN, Vol. 15, no. 2 (2009), 84-93. (*In Russian.*)

A.L. Gavriilyuk: *On isospectral subgraphs of biregular geodetic graphs of diameter 2*. Trudy IMM UrO RAN, Vol. 13, no. 4 (2007), 49-60. (*In Russian.*)

CONFERENCES, SEMINARS

Algebraic Combinatorics Workshop (USTC, Hefei, China), Nov., 2014.

Invited talk.

Godsil65 (Waterloo University, Canada), June, 2014.

Session chair.

Modern Trends in Algebraic Graph Theory (Villanova University, USA), June, 2014.

Talk "On a Characterization of the Grassmann graphs $J_2(2D, D)$, $D \geq 3$ ".

Japan Conference on Graph Theory and Combinatorics (Nihon University, Tokyo, Japan), May, 2014.

Talk "On Q -polynomial distance-regular graphs of type 2".

Vertex Operator Algebras, and Algebraic Combinatorics (RIMS, Kyoto, Japan) March, 2014.

Invited talk "Characterization of the bilinear forms graphs $Bil_2(n \times n)$, $n \geq 3$ ".

Korea-Japan Workshop on Algebra and Combinatorics (KAIST, South Korea) Jan., 2014.

Invited talk "Characterization of the bilinear forms graphs $Bil_2(n \times n)$, $n \geq 3$ ".

Finite fields and their Applications (Fq11) (Otto-von-Guericke University, Magdeburg, Germany) July, 2013.

Talk "Cameron – Liebler line classes in $PG(n, 4)$ ".

Shanghai Conference on Algebraic Combinatorics, Shanghai, China, Aug. 22, 2012.

Talk "Cameron – Liebler line classes in $PG(3, 4)$ ".

KPPY Combinatorics Seminar, South Korea, April 7, 2012.

Invited talk "Perfect 2-colorings of Johnson graphs $J(v, 3)$ ".

Incidence Geometry and Buildings, Ghent, Belgium, Feb. 10, 2012.

Talk "Perfect 2-colorings of Johnson graphs $J(v, 3)$ ".

Geometric and Algebraic Combinatorics 5, Oisterwijk, the Netherlands, Aug. 14, 2011.

Talk " *There exist no distance-regular graphs with intersection arrays $\{52, 35, 16; 1, 4, 28\}$ or $\{45, 30, 7; 1, 2, 27\}$* ".

Microsoft Computer Vision Summer School, Moscow, July 27 – Aug. 4, 2011.

Workshop ImageSOFC (solid-oxide fuel cells image processing), Brussels, Belgium, Sept. 11, 2010.

Theory of groups and its applications, Nal'chik, Russian Federation, July 4 – July 10, 2010.

Talk " *On the Koolen-Park inequality and Terwilliger graphs*".

Algebra and its applications, Nal'chik, Russian Federation, July, 2009.

Talk " *On Terwilliger graphs in which the neighborhood of each vertex is isomorphic to the Hoffman-Singleton graph*".

Algebra and its applications, Krasnoyarsk, Russian Federation, Aug. 12 – Aug. 18, 2007.

Talks " *Terwilliger graphs in which the neighborhood of some vertex is isomorphic to the Petersen graph.*", " *On the regularity problem in Terwilliger graphs.*"

GRANTS, FELLOWSHIPS, VISITS

- Postdoctoral Fellowship granted by Japan Society for the Promotion of Science (JSPS) at Tohoku University (Sendai, Japan). Host Professor: Akihiro Munemasa. September 2013 – September 2014
- Postdoctoral Fellowship granted by President of Russian Federation MK-1719.2013.1, 2013-2014.
- Yeungnam University (South Korea), Jan. 13 – 20, 2013.
- Grant of RFBR 12-01-31098, 'Characterisations of metric association schemes, their codes, and subsets in finite projective geometries', 2012-2013.
- University of Science and Technology of China (Hefei, PR China), Aug. 24 – 31, 2012.
- POSTECH (Pohang, South Korea), March 25 – April 9, 2012.
- University of Maribor (Slovenia), Dec. 8 – Dec. 25, 2011.
- Institute of Mathematics, Siberian Branch of the Russian Academy of Sciences (Novosibirsk, Russian Federation), July 11 – July 25, 2011.
- Postdoctoral Fellowship granted by President of Russian Federation MK-938.2011.1, 2011-2012.
- Juelich Forschungszentrum (Juelich, Germany). Visit sponsored by BMBF, Aug. 2010 – Sept. 2010.
- The Lomonosov Award (the Russian Academy of Sciences) for students (in Mathematical Sciences), 2008.

OTHER ACTIVITIES

Reviewer for Mathematical Reviews (AMS): 24 reviews.

Reviewer for: Electronic Journal of Combinatorics, Journal of Algebraic Combinatorics, European Journal of Combinatorics, Graphs and Combinatorics, Discrete Mathematics, Discrete Mathematics and its Applications, Algebra and Logic.

FURTHER INFORMATION

Languages: Russian (native), English.

Skills: MATLAB, MAGMA, C, OpenCV.